DIVERSITY OF REPTILES OF URUGUAY: KNOWLEDGE AND INFORMATION GAPS

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ABSTRACT

The aim of this work is to summarize the scientific knowledge of Uruguayan reptiles. In this study we considered 61 species of reptiles based on 4700 records from the main scientific collections of the country. We derived geographic distributions from georeferenced records superimposed on a grid of 302 quadrants and we generated a cumulative curve of species. Based on estimates of species richness, we suggest that as many as seven additional species of continental reptiles could be present in Uruguay, which have not been found in the field but, if accounted for in future studies, they would eventually increase reptile richness to 68 species. The degree of knowledge at the moment of the present analysis would be 90.2%. The observed richness increases linearly with the collection effort and suggests that the optimal effort per cell is 80 records. In 29% of the quadrants there was no information, whereas 67% can be considered undersampled. Only 4% of the quadrants may be interpreted as well-known. The degree of knowledge about the diversity of reptiles is very limited in terms of scientific evidence. This study allows a better understanding of the nature and localization of the information gaps concerning of this zoological group.

Key words: Reptiles, Biological conservation, Geographic distribution, Uruguayan diversity.

RESUMEN

Diversidad de reptiles de Uruguay: conocimiento y vacíos de información. El objetivo de este trabajo es presentar el estado de conocimiento científico de los reptiles del Uruguay. Este estudio consideró 61 especies de reptiles. Se utilizaron 4700 registros provenientes de las principales colecciones científicas del país. Derivamos las distribuciones geográficas a partir de registros geo-

referenciados superpuestos sobre una grilla de 302 cuadrantes y generamos una curva acumulativa de especies. Sobre la base de las estimaciones de riqueza de especies, se sugiere que al menos siete especies de reptiles continentales más podrían estar presentes en Uruguay, y por tanto con estudios futuros la riqueza podría incrementarse a 68 especies. El grado de conocimiento hasta el momento del presente análisis sería de 90.2%. La riqueza observada se incrementa linealmente con el esfuerzo de colecta y se sugiere que el esfuerzo óptimo por celda es de 80 registros. El 29% de los cuadrantes carecen por completo de información, mientras que el 67% se puede considerar submuestreado. Sólo 4% de los cuadrantes se pueden interpretar como adecuadamente conocidos. El grado de conocimientos sobre la diversidad de reptiles es muy limitado en términos de evidencia científica. Este estudio permite una mejor comprensión de la naturaleza y localización de las lagunas de información en este grupo zoológico.

Palabras clave: Reptiles, Conservación biológica, Distribución geográfica, Diversidad uruguaya.

INTRODUCTION

Knowledge of the taxonomy and distribution of the fauna and flora are essential for their conservation. For instance, methodologies that evaluate conservation status and assign species to threat categories (i.e. IUCN red lists) depend mainly on the identity of an organism and its geographic distribution.

Background information about the taxonomy and distribution of reptiles inhabiting Uruguay are found in the literature published by foreign and local authors. In order to provide an update about the taxonomy and geographic distribution of reptiles from Uruguay and to identify information gaps, we conducted a literature review and a general survey of the scientific collections. In this vein, our work aimed to estimate how many reptile species could still be unknown in Uruguay based on an analysis of accumulated sampling effort. On the other hand, we evaluated patterns of expected richness at a detailed spatial scale to identify poorly known areas and based on this information, to provide recommendations for targeted sampling efforts and for optimal use of financial resources.

Historical perspective

The history of herpetology in Uruguay begins with the observations made by William Toller during a trip to the “Banda Oriental” (Uruguay) and the “Río de la Plata” in 1715. From the existing records, it is possible to identify at least two species native to Uruguay: *Xenodon dorbignyi* and *Phrynops williamsi* (Narancio & Vaz-Ferreira, 1955). The legacy of Dámaso Antonio Larrañaga represents a testimony of Uruguayan natural ecosystems in the 19th century. Based on his illustrated works, we can confirm that this naturalist made observations about Uruguayan populations of some common species of reptiles, such as *Clelia rustica*, *Lygophis anomalus*, *Philodryas aestiva, Teius oculatus*, and *Tupinambis merianae*, among others. In some cases, it is not possible to determine the species because diagnostic features for correct identification are not visible due to the lack of detail in the color plates. Nonetheless, these

works were not published until the 20th century, and for this reason, they have more of a historical value than a specific contribution to the discipline.

Around mid-19th Century, Uruguay and the region received a number of memorable naturalists from Europe, such as Alcide d´Orbigny and Charles Darwin. The specimens collected during these scientific expeditions were the first documented records of animals from Uruguay. The knowledge about Uruguayan reptiles also benefited from a number of other works of worldwide fame that appeared during the same century from authors that contributed to form the taxonomic basis of reptiles, such as Boulenger (1885a-d; 1886; 1889; 1891; 1894a,b; 1896; 1902), Cope (1860a,b; 1862a-c; 1864a,b; 1868; 1869; 1874; 1878; 1885), Günther (1858; 1862; 1863; 1884; 1895), Wagler (1824; 1828; 1830), Jan (1865) and Jan & Sordelli (1860-1881), and Wiegmann (1834).

As pointed out above, the turning point in the study of reptiles in Uruguay was the year 1925 when the first checklist with remarks of Uruguayan reptiles was published (Devincenzi, 1925). It contained a series of brief descriptions depicting 45 species, among which there were taxa that now are unknown to exist in Uruguay. Devincenzi (1925) also suggested the occurrence of *Eunectes notaeus* based on two examples of uncertain origin from "Uruguay", which was confirmed 71 years later by Achaval & Meneghel (1996). In addition, Devincenzi also quoted and refers explicitly to the catalogues from the British Museum (Boulenger, 1885c,d; 1894b; 1896), and other authors such as Koslowsky (1898), Berg (1884; 1898; 1901) and Serié (1919a,b; 1936). Later, Devincenzi himself published periodical updates (1929a,b; 1930; 1939).

In 1945-46, the Faculty of Humanities and Sciences was founded, complementing and providing a further boost to the studies conducted by the National Museum of Natural History. Some of the first works that marked the beginning of the study of reptiles in Uruguay were those belonging to Vaz-Ferreira & Sierra de Soriano (1960, 1961). Peters & Donoso-Barros (1970) and Peters & Orejas-Miranda (1970) were other major reviews that created an important precedent in the study of reptiles in the Neotropical region. Although new works maintained a descriptive approach, they became more exhaustive, and in the 70's, the scientific production published in journals began to cover more specific subjects such as ethology and ecology (Vaz-Ferreira *et al.*, 1970; 1973; Vaz-Ferreira & Sierra, 1973; Gudynas & Pebé, 1977; Gudynas, 1979a,b; 1980; 1986; Gudynas & Gambarotta, 1980; Melgarejo & Meneghel, 1980 among others).

Recently, several graduate theses with a wide taxonomic scope (i.e., Achaval 1997 for Uruguayan reptiles; Meneghel 1997 for Crotalidae) or focused on certain species (Borteiro, 2005; Panzera, 2011) marked an important advance in the knowledge of this group in Uruguay. On the other hand, some works contributed to establish a solid base for the study of this group, particularly the monographic work "Reptiles de Uruguay" (Carreira *et al.*, 2005). Other relevant works about this group (technical or for a non-specialized audience) were Carreira (2002), Achaval & Olmos (1997; 2003; 2007) and Carreira *et al.* (2008).

Conservation

Several works summarized the fragmented information available about conservation of the Reptiles in Uruguay (e.g. Achaval & San Martín, 1983; Maneyro & Carreira, 2006). Achaval & Olmos (1997) also evaluated conservation status but did not specify the method used for evaluation but

applied some categories with similar names to those used by IUCN (NA – not endangered, NE – not evaluated, V – Vulnerable, EP – endangered). Later, Fagundes & Carreira (2000) applied for the first time the standardized SUMIN index (Recta *et al*., 1994) to Uruguayan snakes. Later, two additional evaluations covered other reptiles by including lizards and amphisbaenids (Carreira, 2004a) and turtles (Carreira *et al*., 2007). More recently, Borteiro *et al.* (2008) evaluated the conservation status of *Caiman latirostris* in Uruguay. Finally, and based on the extended IUCN criteria, Canavero *et al.* (2010) published the Red List of Reptiles (and also Amphibians) of Uruguay concluding a long process that originally started with early initiatives that were truncated for multiple reasons since 2003.

MATERIAL AND METHODS

Our study used data from 61 species out of a total of 66 species of reptiles known to occur in Uruguay when we carried out the analyses. At the present time, and as already pointed out above, there are 71 reported species of reptiles in Uruguay, 66 of which are continental.

For the historical review we used the revisionary works of Achaval (1997) and Carreira *et al.* (2005), which contain most of the references to the group in Uruguay. We used public and private bibliographic collections to review the materials when necessary. This literature usually relies on voucher specimens and associated records housed in the two major local scientific collections: the Faculty of Sciences (ZVC-R; Universidad de la República) and the Natural History Museum (MNHN; Ministry of Education and Culture).

The quantitative information accumulated on reptilian diversity of Uruguay was assessed via database analyses from the Museo Nacional de Historia Natural and Zoología Vertebrados de la Facultad de Ciencias (Universidad de la República). We also updated the database with the new records housed at ZVC-R.

In order to estimate geographic distributions, all records were geo-referenced on a grid of 302 quadrants each measuring 30 x 22 km, based on the National Cartographic Plan and integrated into a Geographic Information System (Arc-GIS). After removing records with undefined geographic coordinates, a total of 4,700 records of reptiles were included. We used the software ESTIMATES (Colwell, 2006) to estimate the richness per quadrant and to fit the model 'Chao 2' for estimating the maximum richness with 95%-confidence interval.

We estimated the optimal sampling effort based on the records per quadrant (i.e., number of records necessary to get an accurate estimate of the richness in a quadrant). We fitted a moving average smoothing (lag = 10) to the relationship between the observed richness and the sampling effort (number of records) on each quadrant. Once the optimal effort per cell was established, the degree of knowledge per grid was summarized with histograms of collection effort.

RESULTS AND DISCUSSION

The assemblage of reptiles of Uruguay

Based on the last taxonomic list of reptiles present in Uruguay (Carreira *et al.,* 2005b) as a working reference and adding the new incorporations to the fauna of this group in the country (Carreira & Lombardo, 2006; Verrastro *et al*., 2006; Estrades *et al*., 2007; Cabrera & Carreira,

2009), there are 71 species of reptiles in Uruguay known until now, including 5 sea turtles (see complete list in Appendix 1) distributed among 22 families and 49 genera. The most numerous family corresponds to the Dipsadidae, which contains three subfamilies, 16 genera and 28 species.

Among the continental fauna, there are five species of freshwater turtles belonging to four genera. One of the most popular and most widespread in the country is known as Morrocoyo (*Trachemys dorbigni*). Due possibly to its aggressiveness and also to its bright colors, it is popularly believed to be a poisonous species. Young specimens (having very intense colors) are illegally sold as pets in local street markets. Also well-known and very widespread is the Snake-necked Turtle (*Hydromedusa tectifera*), a species that has a long neck from which its popular name derives. The Black Spine-neck Swamp Turtle (*Acanthochelys spixii*) can be identified by a longitudinal depression in the center of its carapace, which is clearly visible in adults; this species is particularly common in the Rocha department. Finally, it is worth mentioning another frequent species, the Hilaire's Side-necked Turtle (*Phrynops hilarii*) and its congeneric mentioned above, the Williams' Side-necked Turtle (*Phrynops williamsi*), the latter being confined to a restricted area and poorly represented in national collections.

Among the Sauria, the most visible species standing out from the rest are the Black Tegu (*Tupinambis merianae*), which is a very common species, popularly known countrywide. The Sand Lizard (*Liolaemus wiegmannii*) can be found in the whole coastal area of Uruguay, even as far as the Río Negro department, associated with marginal sandy dunes. One of the Sauria that deserves particular attention is the Wiegmann's Tree Lizard (*Anisolepis undulatus*), since this little-known species is threatened worldwide (IUCN, 2011; category = vulnerable). In Uruguay, this species is widely distributed, while it is probably extinct in Argentina and scarce in Brazil (Etheridge & Williams, 1991; Cei, 1993).

Among snakes, four species are considered dangerous to humans. Within the Viperidae, the Urutu or Crucera (*Bothrops alternatus*), the Yara or Yarará (*Bothrops pubescens*) and finally, the Rattlesnake (*Crotalus durissus terrificus*). The Coral Snake (*Micrurus altirostris*) is the only Elapidae in the fauna of Uruguay. At the present, there are around 65 reports of accidents per year approximately that refer exclusively to *B. pubescens* and *B. alternatus* (Carreira *et al.*, 2008) but accidents by a Coral Snake have never been reported in Uruguay. The occurrence of *C. d. terrificus* in Uruguay has been reduced because their populations in the South of the country went extinct possibly due to the destruction of habitats caused by the expansion of the touristic industry (Bérnils *et al.*, 2007). At the present time, this species is facing conservation problems at national level and its hunting is forbidden according to the current official regulations.

The most frequent Colubrid species are the Yellow-Lined Snake (*Lygophis anomalus*), the Yellow-Bellied Liophis (*Liophis poecilogyrus sublineatus*), the South American Hognose Snake (*Xenodon dorbignyi*), and the Patagonian Green Racer (*Philodryas patagoniensis*). On the other hand, there are very rare taxa including *Calamodontophis paucidens* and *Xenodon histricus*. However, other species are very uncommon in our country due possibly to poor sampling or because they are sparsely distributed, such as *Leptophis marginatus*, *Philodryas olfersii olfersii*, *Chironius bicarinatus*, *Sibynomorphus turgidus*, *Xenodon merremii*, and *Eunectes notaeus*, among others.

In Uruguay, two invasive Gekkonidae have been found so far. The Wall Gecko (*Tarentola*

mauritanica mauritanica) is found in urbanized areas of the Montevideo province (Achaval & Gudynas, 1983; Carreira *et al*., 2005b). On the other hand, the African House Gecko (*Hemidactylus mabouia*) has been occasionally seen in the Montevideo and Rocha provinces but it is currently found in the city of Rivera (Carreira *et al*., 2005a), where young and adult individuals have been collected, which probably demonstrates their success in settling down in this city's downtown (Bérnils *et al*., 2007).

Some taxa have only sporadically been reported in the country with some cases corresponding to mistakes in the source material. However, in other cases the species occasionally arrived by natural means or via human transportation, but they have no permanent populations in the country. Examples of these are the species that reach the coasts of Uruguay, carried by floating vegetation or "flotsam" that comes from Argentina during floods of the Paraná River. Many of these events have been confirmed with the arrival of species that do occur in Uruguay, such as *Helicops infrataeniatus*, *Liophis jaegeri*, *L. semiaureus*, *Thamnodynastes hypoconia,* and *Bothrops alternatus* (Achaval *et al*., 1979; Sarli *et al.,* 1992).

Some other species have also been recorded which do not occur in the country, such as the *Thamnodynastes chaquensis* snake (Carreira, 2004b; Bérnils *et al.,* 2007). On the other hand, there are isolated cases of accidental transportation of reptiles by humans, such as *Chironius bicarinatus, Hemidactylus mabouia* and *Sibynomorphus mikanii*. There are several species that have some kind of published reference, but their presence has not been confirmed in Uruguay. The list of these taxa was cited in Achaval (1997, 2001) and Carreira *et al*., (2005b). In some cases and as previously mentioned, some of them were confirmed subsequently, such as *Eunectes notaeus* and *Hemidactylus mabouia* (Achaval & Meneghel, 1996; Carreira *et al*., 2005a).

Inventory completeness of reptiles

As pointed out above, for the purposes of biodiversity conservation is necessary to identify the species inhabiting an area based on two main sources of information: the literature and collection records. However, it is fundamental to understand that this information most likely represents a biased sample of the diversity that actually exists in the territory. Moreover, collection records should be analyzed at a more detailed spatial scale since information at the country-level is insufficient or inadequate for evaluating the potential of protected areas to conserve biodiversity within the country.

The estimated richness of Uruguayan reptiles, plotted against the accumulated sampling quadrants, displays an asymptotic curve, indicating convergence of the model (Fig. 1). The estimated (average) maximum richness (61) was almost identical to the observed richness (61), suggesting that the degree of knowledge of this fauna is very close to complete. However, considering the upper bounds of the confidence interval, seven species of continental reptiles might still be unknown, which would increase reptile richness to 68 species. Under this scenario, the degree of knowledge at the moment of the present analysis would be of 90.2%. As already stated above, after carrying out the analyses, four new species were incorporated to the reptilian fauna, three of which are continental. According to this new piece of information and considering the results of the analysis, four species would remain to be incorporated.

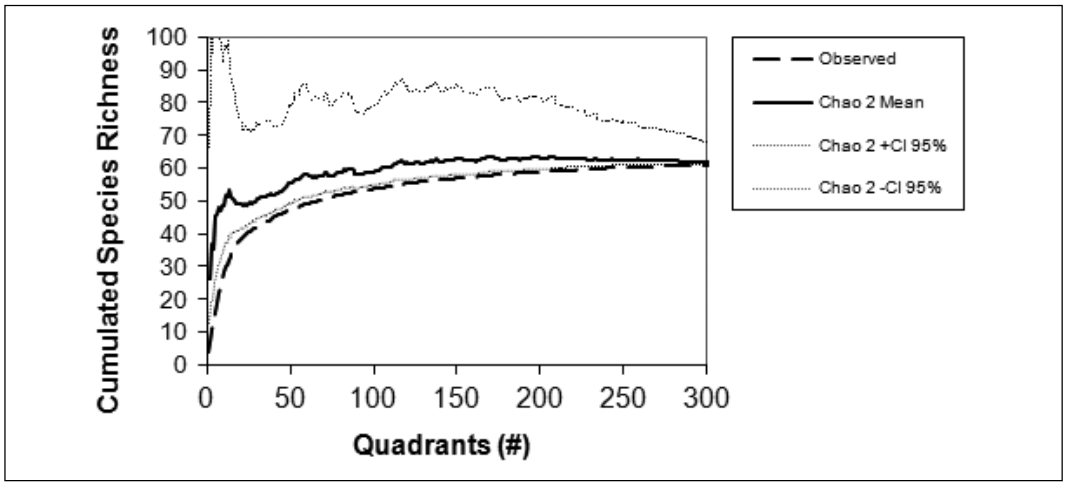

Fig. 1. Accumulated richness.

The observed richness increases linearly with the collection effort until it reaches a effort value of ~80 records but becomes relatively independent afterwards. This suggests that the optimal sampling effort per cell is of 80 records (Fig. 2). Based on the histogram of effort (number of records) per quadrant in the reptile collection, we can gather that 29% of the quadrants are entirely lacking information, whereas 67% can be considered undersampled (Fig.

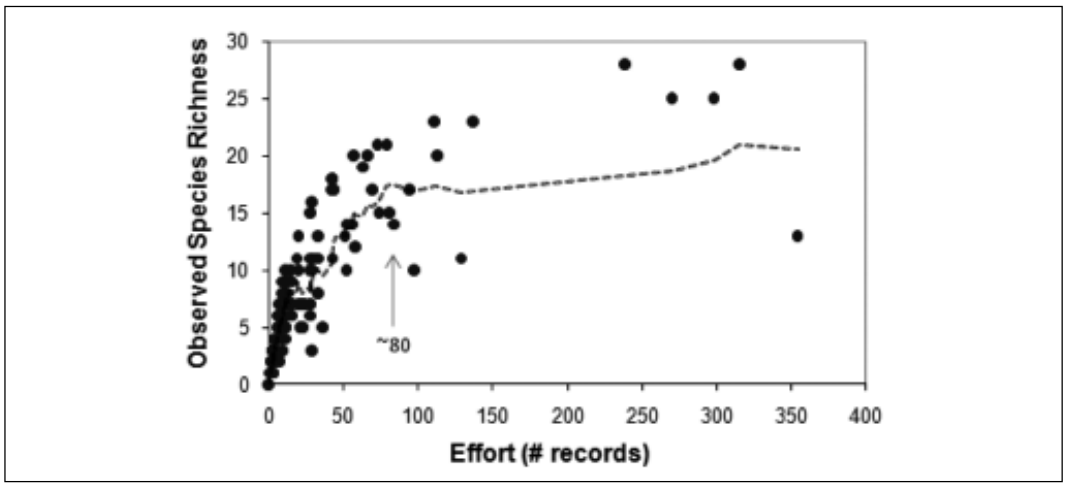

Fig. 2. Registered richness.

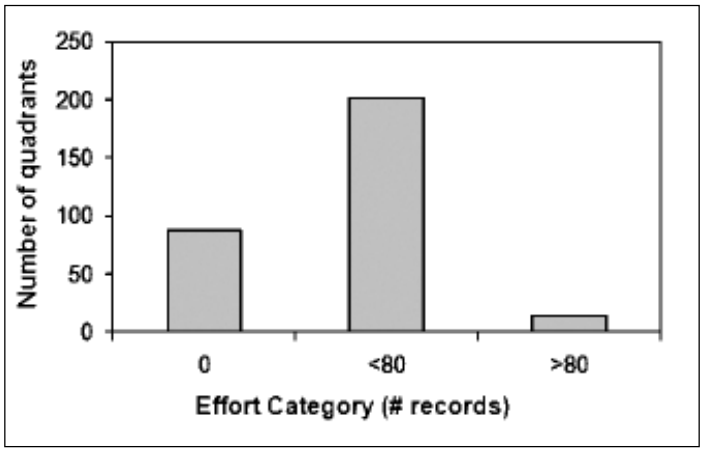

Fig. 3. Category 0 shows the quadrants that lack information. Category <80 shows the subsampled grids, i.e. with underestimated richness, whereas category >80 shows the appropriately sampled grids.

3). Therefore, only 4% of the quadrants may be interpreted as well-known, indicating that the degree of knowledge about the diversity of reptiles at the local level is very limited in terms of scientific evidence. The geographic distribution of the collection effort for reptiles within Uruguay shows sectors that have sufficient collection intensity, like in coastal areas of the "Río de la Plata" and in portions of the departments of Artigas and Rivera (Fig. 4).

Regarding to the above-mentioned aspects, it is worth making some observations that can help to understand these information gaps. Systematic sampling efforts to cover gaps of information have never been undertaken in Uruguay. Instead, deliberate efforts have partially targeted isolated regions or remote sites with difficult access, but the rest of the collections can be considered as "casual". Many of the specimens are obtained by people associated to the institutions in some way, whether specialists or not. These aspects set a limit on the information that national scientific collections can provide in relation to the abundance or distribution of species. Good examples are two very common taxa in our country: the Black Tegu (*Tupinambis merianae*) and the Patagonian Green Racer (*Philodryas patagoniensis*). There are 75 specimens of *T. merianae* and 402 of *P. patagoniensis* in the collection of Reptiles of the Faculty of Science (ZVC-R). Both reptiles are frequently found in highways rolled over by vehicles ("road kill"), but due to a difference in size, the Black Tegu is less frequently collected (Achaval, 1997). On the other hand, in the case of living specimens, the influence of cultural aspects can be observed, as for example in the fact that turtles are less collected than the rest of reptiles. These reasons make it possible to explain some of the information gaps possibly caused by the conjunction of "casual" collections with cultural biases/misperceptions and idiosyncratic aspects of each specimen (e.g., size, frequency of encounter, frequency of finding dead, dangerousness, and others). As for the frequency of findings, it is worth mentioning that reptiles are not commonly found in Uruguay during fieldwork, in relation to both other taxa in the country or to reptiles in other regions. In either way, the frequency of collection is low even when using specific collection techniques or traps.

All these aspects account for the lack of knowledge about this zoological group in Uruguay at

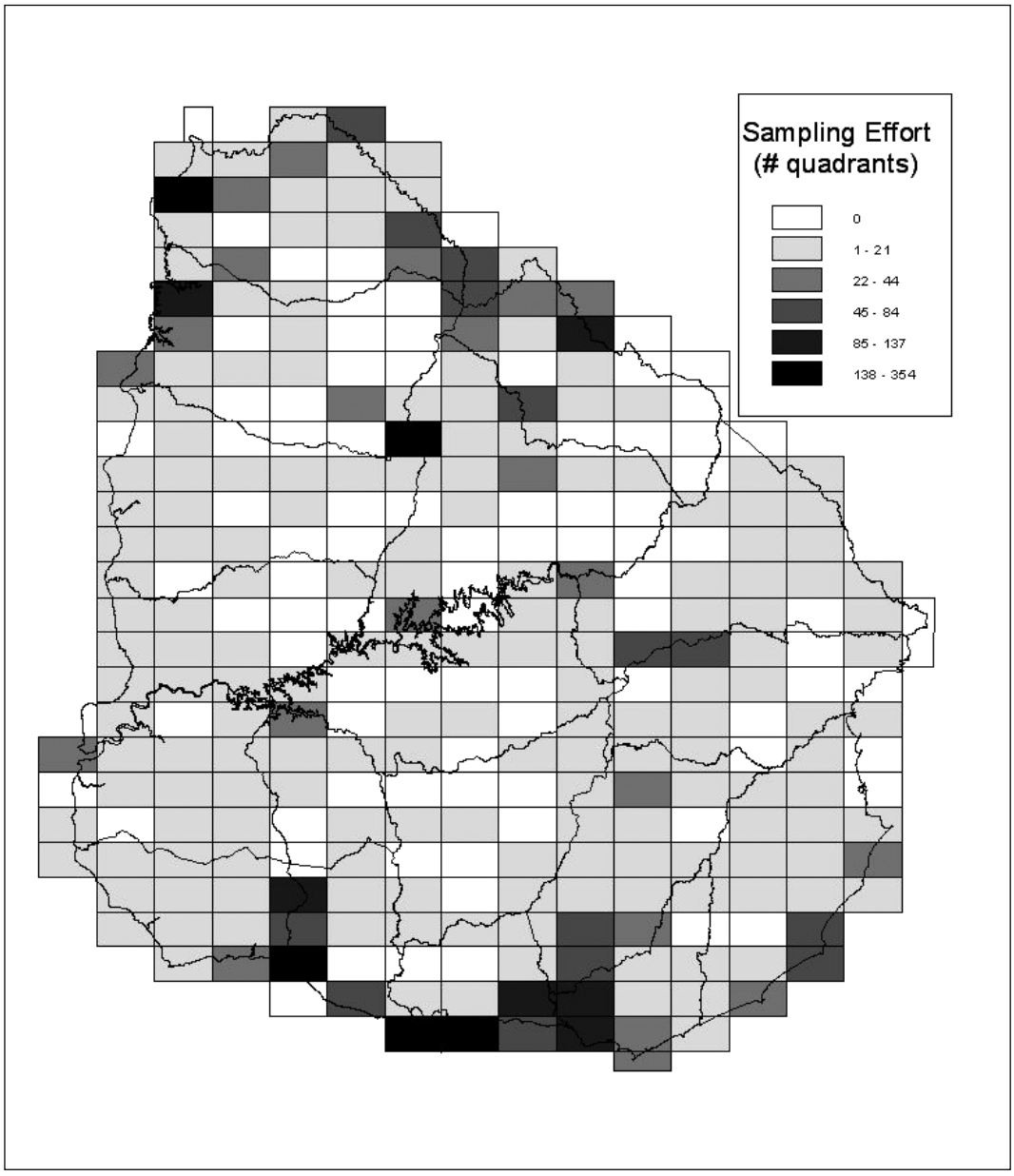

Fig. 4. Geographic distribution of sampling effort.

the present time. This lack of information makes more difficult the conservation of reptile species in Uruguay because decision-making should be based on this existing biased information (see also Canavero *et al*., 2010). Unfortunately, a good example of this problem was the extinction of *Cnemidophorus charrua* at Cabo Polonio (Rocha department; Cabrera & Carreira, 2009), which was the first endemic reptile species lost in Uruguay probably a long time before it was actually described, emphasizing our point that a good taxonomic knowledge is a prerequisite for effective management plans.

Future directions

There are important deficiencies caused by the lack of systematic sampling of reptiles in Uruguay. This situation results in the expansion of the known distributions of some taxa at national and even regional scales to be dramatically modified according to the new data derived from fieldwork (e.g.: *Chironius bicarinatus*, *Lygophis flavifrenatus*, Carreira & Lombardo, 2007a,b). In some cases, effort in the field has produced new species for the country (e.g.: *Atractus reticulatus*, *Calamodontophis paucidens*, Carreira *et al*., 2004; Franco *et al*., 2000). Moreover, field research about the life-history of each species is practically absent, even data from abundant populations found in certain areas (Borteiro *et al.,* 2006; 2009). On the other hand, a better use of the material available is essential to obtain more information on different aspects of the biology of poorly known and/or rarely collected species. Data on diet and reproduction can be very important, as well as morphological information useful for systematics, such as the description of the hemipenis of *Calamodontophis paucidens* (Carreira & Lombardo, 2008). A greater involvement with local communities will undoubtedly provide very important feedback, besides of potential progress in areas such as ethnoherpetology, because several records of reptiles of great importance in Uruguay were obtained by amateur herpetologists. Additionally, and in connection with the ideas raised above, basic knowledge about taxonomy and natural history as well as the support of the local community will become useful resources for developing 'in situ' conservation plans to deal with threatened species such as the Sand Lizard (*Liolaemus wiegmanii* – Maneyro & Carreira, 2006) in heavily urbanized areas of the country.

In summary, this study enables a better understanding of the nature and localization of the information gaps of reptiles in Uruguay. From a practical point of view, this information is fundamental to the design and efficient development of future fieldwork studies. In coordination with other research groups, it will be possible to plan collection trips to target these knowledge gaps, facilitating combined efforts for a more rationale use of limited funds and equipment. We also encourage future field studies to evaluate the sampling effort for the incorporation of new locations. This piece of information would be invaluable for a more efficient fieldwork because it will help to refine our estimates of the minimum number of sites per grid as well as the minimum number of records per location.

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APPENDIX 1 – LIST OF REPTILES WITH CONFIRMED PRESENCE IN URUGUAY

This list is based on Carreira *et al.* (2005b) with the inclusion of some unpublished theses (Borges-Martins, 1998; Silva, 2000a,b; Pedroso dos Santos-Jr., 2005; Rufino de Albuquerque, 2008).

Testudines (10 species)

Familia Emydidae

Género *Trachemys* Agassiz, 1857

1 - *Trachemys dorbigni* (Duméril & Bibron, 1835)

Familia Cheloniidae

Género *Caretta* Rafinesque, 1814

2 - *Caretta caretta* (Linnaeus, 1758)

Género *Chelonia* Brogniart, 1800

3 - *Chelonia mydas* (Linnaeus, 1758)

Género *Eretmochelys* Fitzinger, 1843

4 - *Eretmochelys imbricata* (Linnaeus, 1766)

Género *Lepidochelys* Fitzinger, 1843

5 - *Lepidochelys olivacea* (Eschscholtz, 1829)

Familia Dermochelyidae

Género *Dermochelys* Blainville, 1816

6 - *Dermochelys coriacea* (Vandelli, 1761)

Familia Chelidae

Género *Acanthochelys* Gray, 1873
7 - *Acanthochelys spixii* (Duméril & Bibron, 1835)
Género *Hydromedusa* Wagler, 1830
8 - *Hydromedusa tectifera* Cope, 1869
Género *Phrynops* Wagler, 1830
9 - *Phrynops hilarii* (Duméril & Bibron, 1835)
10 - *Phrynops williamsi* Rhodin & Mittermeier, 1983

Crocodylia (1 species)

Familia Alligatoridae

Género *Caiman* Spix, 1825
11 - *Caiman latirostris* (Daudin, 1801)

Squamata – Anfisbénidos (5 species)

Familia Amphisbaenidae

Género *Amphisbaena* Boulenger, 1885
12 - *Amphisbaena darwinii* Duméril & Bibron, 1839
13 - *Amphisbaena microcephala* (Wagler, 1824)
14 - *Amphisbaena munoai* Klappenbach, 1960
15 - *Amphisbaena trachura* Cope, 1885
16 - *Amphisbaena kingii* (Bell, 1833)

Squamata – Saurios (17 species)

Familia Leiosauridae

Género *Anisolepis* Boulenger, 1885
17 - *Anisolepis undulatus* (Wiegmann, 1834)

Familia Liolaemidae

Género *Liolaemus* Wiegmann, 1834
18 - *Liolaemus occipitalis* Boulenger, 1885
19 - *Liolaemus wiegmannii* (Duméril & Bibron, 1837)

Familia Tropiduridae

Género *Stenocercus* Duméril & Bibron, 1837
20 - *Stenocercus azureus* (Müller, 1882)
Género *Tropidurus* Wied, 1825
21 - *Tropidurus torquatus* (Wied, 1820)

Familia Gekkonidae

Género *Hemidactylus* Gray, 1825

22 - *Hemidactylus mabouia* (Moreau de Jonnès, 1818)

Familia Phyllodactylidae

Género *Homonota* Gray, 1845

23 - *Homonota uruguayensis* (Vaz-Ferreira & Sierra de Soriano, 1961)

Género *Tarentola* Gray, 1845

24 - *Tarentola mauritanica mauritanica* (Linnaeus, 1758)

Familia Anguidae

Género *Ophiodes* Wagler, 1828

25 - *Ophiodes intermedius* Boulenger, 1894

26 - *Ophiodes aff. striatus* (Spix, 1825)

27 - *Ophiodes vertebralis* Bocourt, 1881

Familia Teiidae

Género *Cnemidophorus* Wagler, 1830

28 - *Cnemidophorus charrua* Cabrera & Carreira, 2009

29 - *Cnemidophorus lacertoides* Duméril & Bibron, 1839

Género *Teius* Merrem, 1820

30 - *Teius oculatus* (D'Orbigny & Bibron, 1837)

Género *Tupinambis* Daudin, 1802

31 - *Tupinambis merianae* (Duméril & Bibron, 1839)

Familia Gymnophthalmidae

Género *Cercosaura* Wagler, 1830

32 - *Cercosaura schreibersii* Wiegmann, 1834

Familia Scincidae

Género *Mabuya* Fitzinger, 1826

33 - *Mabuya dorsivittata* Cope, 1862

Squamata – Serpientes (38 species)

Familia Anomalepididae

Género *Liotyphlops* Peters, 1881

34 - *Liotyphlops ternetzii* (Boulenger, 1896)

Familia Leptotyphlopidae

Género *Epictia* Gray, 1845

35 - *Epictia munoai* (Orejas-Miranda, 1961)

Familia Boidae

Género *Eunectes* Wagler, 1830

36 - *Eunectes notaeus* Cope, 1862

Familia Colubridae

Género *Chironius* Fitzinger, 1826

37 - *Chironius bicarinatus* (Wied, 1820)

Género *Leptophis* Bell, 1825

38 - *Leptophis marginatus* (Cope, 1862)

Género *Tantilla* Baird & Girard, 1853

39 - *Tantilla melanocephala* (Linneaus, 1758)

Familia Dipsadinae

Género *Atractus* Wagler, 1828

40 - *Atractus reticulatus* (Boulenger, 1885)

Género *Boiruna* Zaher, 1996

41 - *Boiruna maculata* (Boulenger, 1896)

Género *Calamodontophis* Amaral, 1963

42 - *Calamodontophis paucidens* (Amaral, 1935)

Género *Clelia* Fitzinger, 1826

43 - *Clelia rustica* (Cope, 1878)

Género *Helicops* Wagler, 1830

44 - *Helicops infrataeniatus* (Jan, 1865)

Género *Liophis* Wagler, 1830

45 - *Liophis almadensis* (Wagler, 1824)

46 - *Liophis jaegeri* (Günther, 1858)

47 - *Liophis semiaureus* (Cope, 1862)

48 - *Liophis poecilogyrus sublineatus* (Cope, 1860)

Género *Lygophis* Fitzinger, 1843

49 - *Lygophis anomalus* (Günther, 1858)

50 - *Lygophis flavifrenatus* Cope, 1862

Género *Oxyrhopus* Wagler, 1830

51 -*Oxyrhopus rhombifer rhombifer* Duméril, Bibron & Duméril, 1854

Género *Phalotris* Cope, 1862

52 - *Phalotris lemniscatus* (Duméril, Bibron & Duméril, 1854)

Género *Philodryas* Wagler, 1830

53 - *Philodryas aestiva* (Duméril, Bibron & Duméril, 1854)

54 - *Philodryas agassizii* (Jan, 1863)

55 - *Philodryas olfersii olfersii* (Lichtenstein, 1823)

56 - *Philodryas patagoniensis* (Girard, 1857)

Género *Psomophis* Myers & Cadle, 1994

57 - *Psomophis obtusus* (Cope, 1864)

Género *Sibynomorphus* Fitzinger, 1843

58 - *Sibynomorphus turgidus* (Cope, 1868)

Género *Taeniophallus* Cope, 1895
59 - *Taeniophallus occipitalis* (Jan, 1863)
60 - *Taeniophallus poecilopogon* (Cope, 1863)
Género *Thamnodynastes* Wagler, 1830
61 - *Thamnodynastes hypoconia* (Cope, 1860)
62 - *Thamnodynastes strigatus* (Günther, 1858)
Género *Tomodon* Duméril & Bibron, 1853
63 - *Tomodon dorsatus* Duméril, Bibron & Duméril, 1854
64 - *Tomodon ocellatus* Duméril, Bibron & Duméril, 1854
Género *Xenodon* Boie, 1826
65 - *Xenodon dorbignyi* (Duméril, Bibron & Duméril, 1854)
66 - *Xenodon histricus* (Jan, 1863)
67 - *Xenodon merremi* (Wagler, 1824)

Familia Elapidae

Género *Micrurus* Wagler, 1824
68 - *Micrurus altirostris* (Cope, 1860)

Familia Viperidae

Género *Bothrops* Wagler, 1824
69 - *Bothrops alternatus* Duméril, Bibron & Duméril, 1854
70 - *Bothrops pubescens* (Cope, 1869)
Género *Crotalus* Linnaeus, 1758
71 - *Crotalus durissus terrificus* (Laurenti, 1768)

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